

ENGINEERING HERITAGE RECOGNITION PROGRAM

PROPOSAL TO NOMINATE AN EHRP ITEM OF INTEREST



Item Name:	Brown Street Ashfield Underbridges
Other/Former Names:	Bland Street level crossing
Locality:	Ashfield, Sydney
Address:	Brown Street, Ashfield
Co-ordinates	-33.88705 South, 151.12429 east
Current Owner:	Sydney Trains
Original Owner:	New South Wales Government Railways (NSWGR)
Current use:	Railway underbridge, road under rail.
Former use:	Railway underbridge, road under rail.
Proposed use:	Railway underbridge, road under rail.
Item Condition:	Excellent
Designer:	Existing Lines Branch, NSWGR. Walter Shellshear is noted on the original plans to receive a copy.

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Builder:	Unspecified contractor to the NSWGR.		
Started:	May 1891	Completed:	1892
History: (100 to 600 words)	<p>Ashfield was an original station when the railway from Sydney to Parramatta Junction opened in 1855. The route was briefly single track, being duplicated within a year, and Bland Street just west of the station crossed the line by means of a level crossing.</p> <p>The route generally was made four tracks in 1892 and the level crossing was replaced with an underbridge with the street, renamed as Brown Street, placed in a deep cutting. At this time there were actually five tracks through the station, including a terminating road and two brick arch bridges were provided for three and two tracks independently. With the general alignment of the crossing, as well as the proximity of the platforms with the widening of the track spacing to include them, the bridge alignment was not square to the road, and the skew was also different for the two bridges.</p> <p>Available land was limited, as was specifically noted on the original plans, so the footprint of the bridges had to be as narrow as possible and skew brick arches were created. The conceptually and structurally easier design of a square arch which projected at both ends as the railway above crossed it at an angle was not an option. This skew design means that while the brick courses are at right angles to the rail axis of the bridge they are truncated where they meet the level skewbacks which are formed of bricks and carefully hewn sandstone blocks with stepped upper surfaces.</p> <p>In 1926 when the route was amplified to six tracks another separate bridge, a steel girder, was created on the northern side of the brick arches to carry a single track and the terminating railway line was made a through route.</p> <p>The bridges illustrate the great skill of the engineers who designed them and the immense tradesmanship of the stone masons and bricklayers who built them.</p> <p>The pair of bridges may not be unique. There is a smaller, 14ft (4.2m) span, skew brick arch bridge carrying a road over the railway on the same line 2½ kilometres east, closer to Sydney, at West Street, Lewisham. It was built in 1891 at the same time as the Brown Street bridges. An existing (1883) wrought iron double-track bridge was widened to accommodate four tracks by adding a brick arch on both ends. These arches are square for most of their length but skewed for a section at the respective exit ends. Private property and high brick parapet walls mean that there is no trackside location available from where these skew arches may be viewed in detail or photographed. Only brief glimpses from a speeding train through sealed windows are possible.</p> <p>It is not known if there is any other skew masonry arch bridge in Australia.</p> <p>There were at least two other skew brick arch bridges built in NSW, amazingly as the first bridges built for the railway in 1854. The bridge at Erskineville Lane fell down twice during construction while the bridge at Newtown was sound. Although such bridges were common in the United Kingdom and techniques for designing them published, it would seem that neither Engineer-in-Chief James Wallace nor contractor William Randle had the skill to build them reliably. Both of these early bridges were subsequently replaced and no pictures of them survive. In his book about the early history of the Sydney Railway Company, Don Hagarty, despite his one-time title as Chief Civil Engineer of the NSW Railway uses images of Scottish bridges to illustrate his narrative as he believed that were no such</p>		

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	bridges in NSW, or Australia. Brown Street bridge, perhaps because it has given such long and trouble-free service, had escaped his notice.
Description: (100 to 600 words):	<p>The nominated structures are two, approximately parallel, brick arch railway underbridges carrying the Main Suburban Railway over Brown Street. The span between abutment walls is 40ft (12.2m) and the arches have a rise of 8ft 6in (2.6m). The southern bridge carries three tracks and the northern bridge two, with a clear width between parapets of 36ft 6in (11.1m) and 25ft (7.6m) respectively.</p> <p>The circular brick arches are 2ft 7½in (800mm), or seven rings of bricks laid on edge, thick. The road clearance at the centre of the arch is 17ft 6in (5.3m)</p> <p>The arches are of plain brickwork, with shaped sandstone blocks at the springing points, carefully worked to receive the truncated brick courses in the arch rings as they intersect the level abutment.</p> <p>The supporting walls and wing walls retaining the approach embankments are of unreinforced brick carried to a sound foundation as determined on site at the time of construction. A note on the original plans specifies 'Concrete to be used if required'. Although what is assumed to be a concrete base is shown in the drawings, there is no indication that, if any concrete was used as a foundation, it was reinforced in any way.</p> <p>The walls retaining the approach embankment are founded on isolated deep brick piers with the spaces between spanned with now deeply buried circular brick arches of 18ft (5.5m) span.</p> <p>The skew of the bridges is not noted on the plans but is scaled at 6° (south) and 9° (north) approximately.</p> <p>The 1892 NSWGR Annual Report states that the bridges were built under contract to the Railways.</p>
Engineering Significance: (Refer Section 2.4 in 'An Engineer's Guide to the Conservation of Australia's Engineering Heritage')	<p>The bridges are large structures under the most heavily trafficked section of the Sydney railway system. The existence of structures of near unique design is largely unrecognised. For 130 years they have carried traffic with apparently little need for maintenance, strengthening or other modification. Before the development of concrete the reliance on brick as an engineering material was great in the nineteenth and early twentieth centuries and while there are many brick arch bridges in New South Wales the bridges at Ashfield are the most sophisticated. They are readily available for inspection from their pedestrian ways, well protected from traffic by guardrails, along both sides of the road.</p>
Webpage Summary: (200 to 300 words)	<p>The skew arch bridges at Ashfield were constructed in 1891 as part of the project to widen the main line through the station to four tracks. Available land was limited and the crossing of Bland Street, previously a level crossing, was not at right angles to the railway. The road underpass was re-named Brown Street.</p> <p>By choosing to build the bridges as brick arches the railways engineers were imposing upon themselves a difficult task but the alternatives, at least in brick, were to introduce a curve into the road on each approach to make the actual crossing square, or to lengthen the arches along their axes and thus have them project into land which was not owned by the railways, but thus allowing the railway to cross obliquely.</p> <p>Another bridge, over the line, of similar skew-brick-arch design but much smaller, was built at the same time at West Street Lewisham, and it remains in service. Two previous attempts had been made in 1854 to build skew arches at Erskineville and Newtown, but the bridge</p>

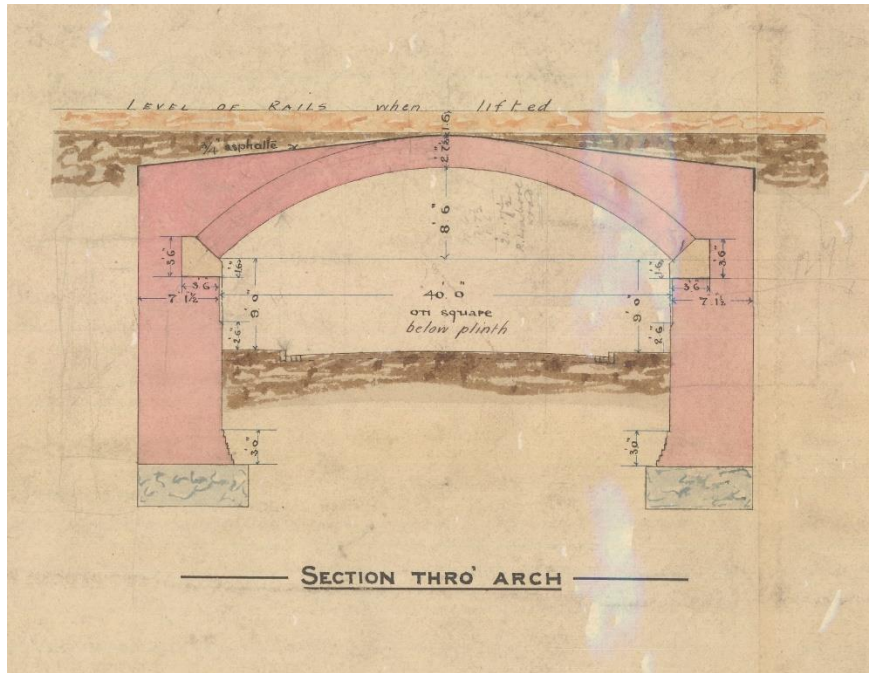
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	<p>under Erskineville Lane had collapsed twice during construction. Both of these early bridges have been replaced as part of track amplification since.</p> <p>As Ashfield was a terminus for some services there were five tracks at the station so two bridges were built for three and two tracks. The skew angles of the two bridges are not the same as they are not quite parallel. In a standard right-angled brick arch the courses of bricks are square across the arch and meet the abutments as a single course. Because of the skew, the brick courses remain square to the rail axis of the bridge, meeting the abutments at an angle, and are thus required to terminate in succession along the stone blocks which are carefully shaped to receive them.</p>		
Engineering Theme:	Transport – River, Rail and Road		
Heritage Listing: (State and/or Local Authority)	None known		
References:	<p>Original plans held by the Australian Railway Historical Society Archives, Alexandria.</p> <p>Unpublished paper <i>The Brown Street Ashfield Skew Brick Arch Underbridge</i> Bill Phippen</p>		
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EHA Branch:	Sydney	Nomination Date:	November 2023

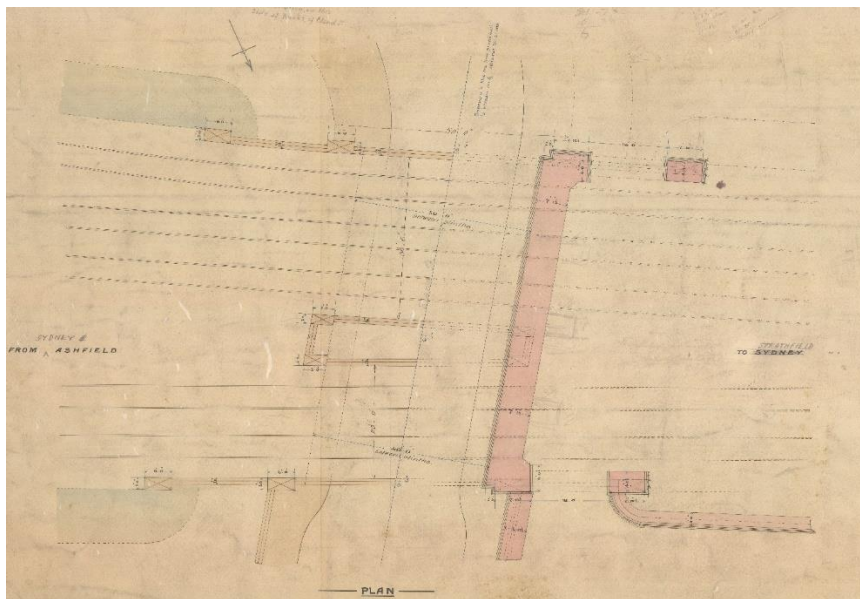


Figure 1 The northern, two-track, bridge. The wall beyond the arch is the pier of the sixth track 1926 steel girder bridge. Bill Phippen 16 September 2023.

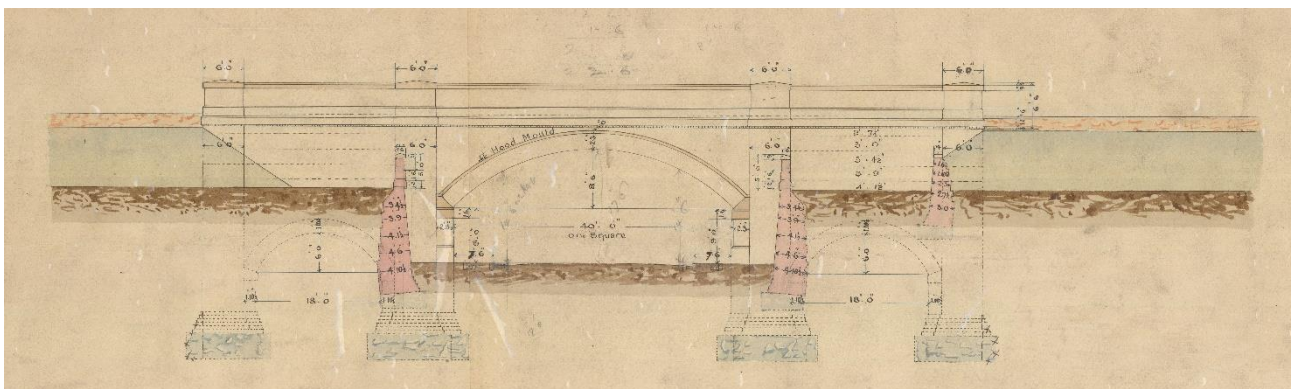
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The section of the bridges from the original plans. There is no detail of the stepped face of the sandstone blocks. ARHS plan collection. ARHS plan collection.



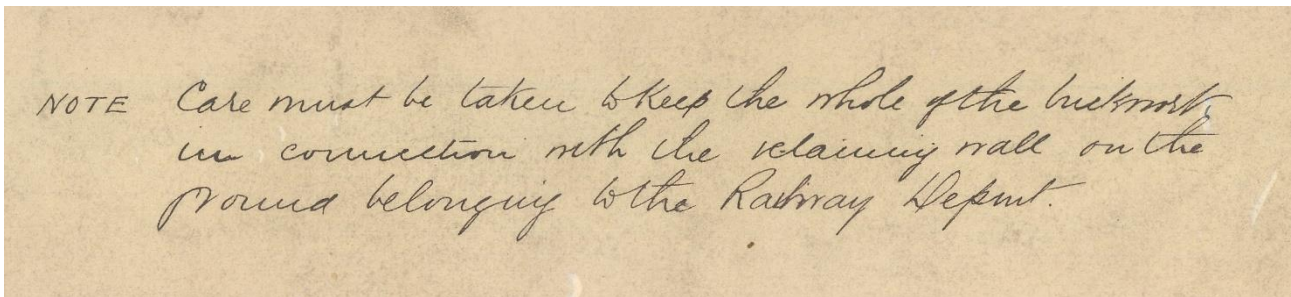
A section of the original plans showing the skew and the divergence of the two bridges. ARHS plan collection.



Section of the bridge from the original plans. Note that there are no details of the complications caused by the skew included in the document. The arches shown behind each arch abutment are foundation structures. ARHS plan

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collection.



The plans include a handwritten note emphasising the limitation of available land into which to fit the bridge. ARHS plan collection.



The brick courses marry into the stone abutments by means of a carefully worked top surface of the masonry. Bill Phippen 16 September 2023



West Street Bridge. The two arches are partly skew brick spans. The earliest bridge is the iron girder in the centre (1883), then the brick arches (1892) and the left hand steel girder bridge over the 5th and 6th tracks was added in 1926. Museums of Hist

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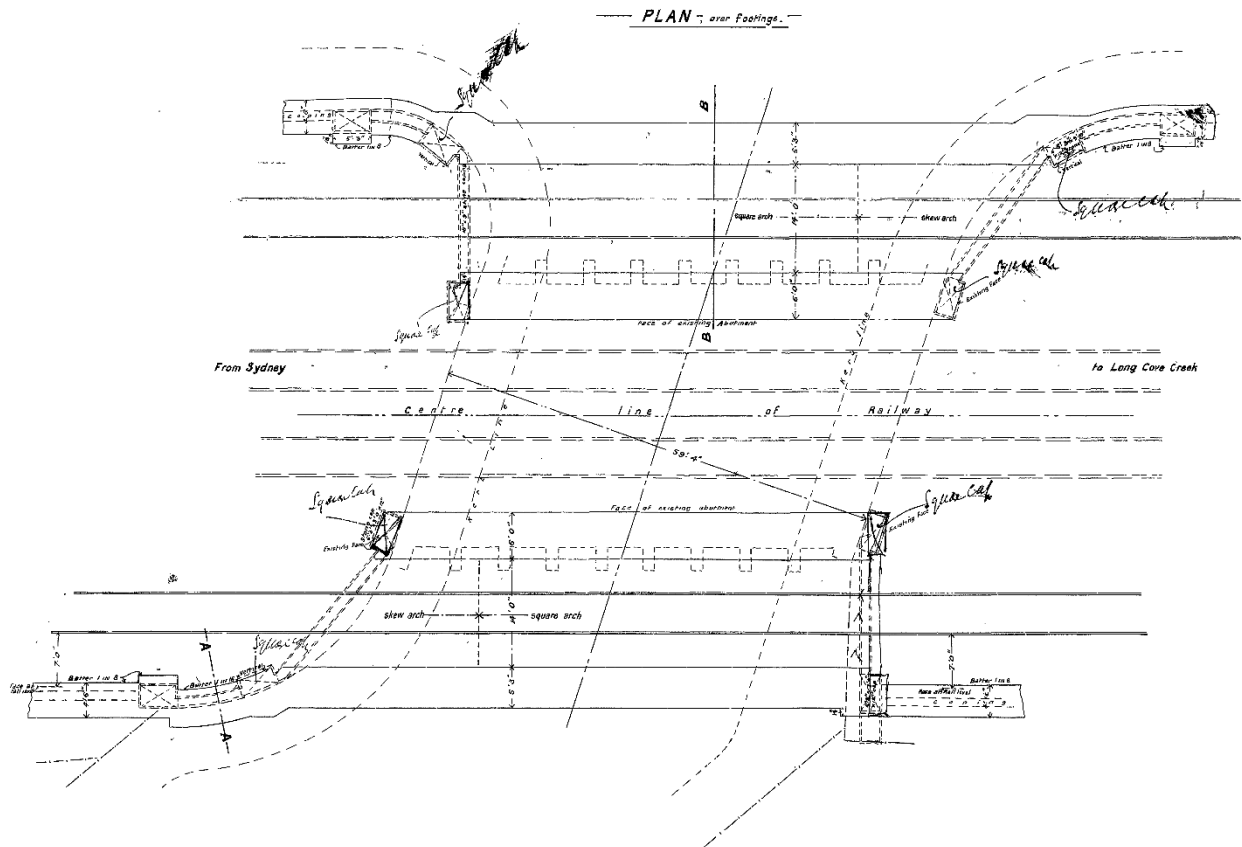


Figure 2 Plan of the January 1891 widening of West Street Bridge by addition of a single-track brick arch on both ends of the overbridge. Parts of the span are shown as skew arches. ARHS plan collection.